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## DIEL EGG-LAYING ACTIVITY OF *AGROTIS EXCLAMATIONIS* (NOCTUIDAE)

IN AN EGG-LAYING RECORDING APPARATUS  
IN SOUTH SWEDEN

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### ABSTRACT

THE DIEL EGG-LAYING ACTIVITY of some noctuids, mainly *Agrotis exclamationis*, was observed by means of an automatic egg-laying recording apparatus. Most of the females tested laid their eggs in the early part of the night. A second weaker peak in the ovipositional activity was found in the latter part of the night. Around midnight, few females laid eggs.

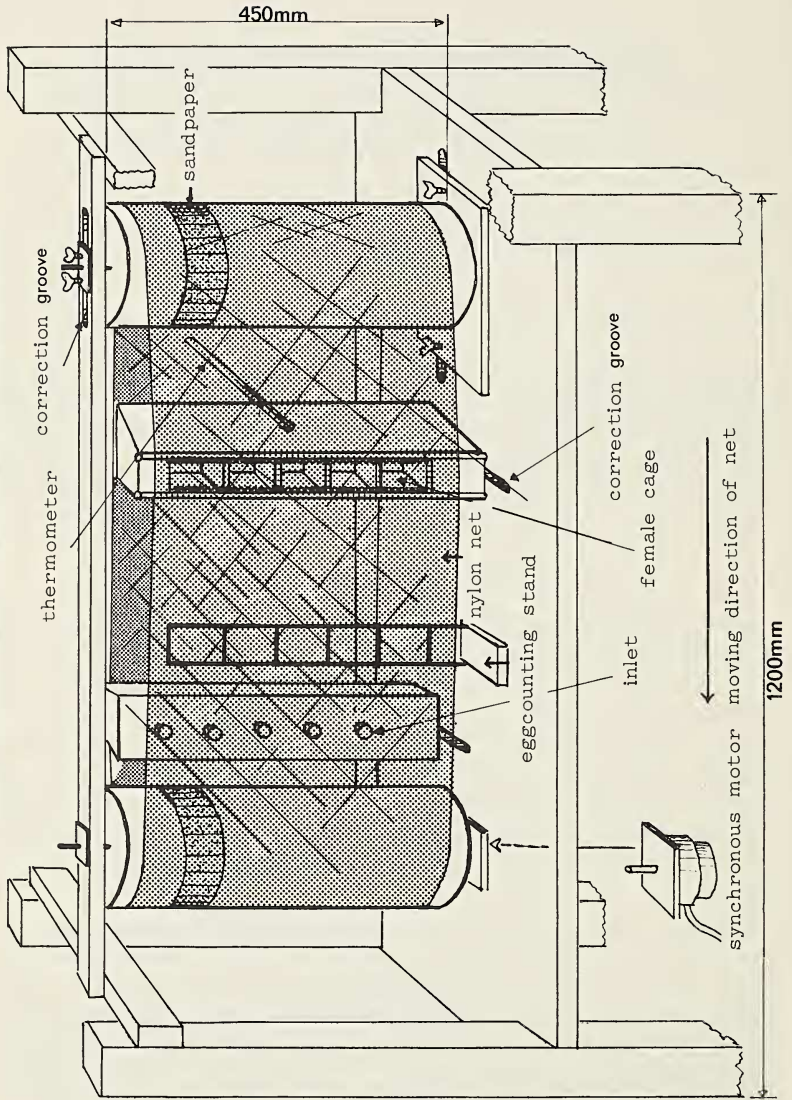
### INTRODUCTION

In connection with light trap experiments performed at Bunkeflo, south of Malmö (at lat. 55°30' N. and long. 13°00' E., Prov. Scania, Sweden) in 1968 and 1969, it was found that the females of noctuids during some summer-months showed a bimodal flight activity (Persson 1971). In order to test if this activity was connected with egg-laying, some observations on the diel ovipositional activity were made in June and July, 1969. On July 1st, sunset and sunrise in the area takes place at 20.51 and 03.30 respectively and the twilight period lasts for 57 minutes.

It had been observed that females kept for flight start observations at Bunkeflo very frequently laid their eggs in the cages rather soon after the twilight period. However, a check of individual females in order to map the diel distribution of egg-laying would be difficult and also too laborious. It seemed obvious that the construction of some kind of automatic recording apparatus was necessary.

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THE EGGLAYING RECORDING APPARATUS



Sylvén (1958) used such an apparatus in his investigations on fruit leaf tortricids. However, if the diel ovipositional activity of individual females should be observed, only one female at a time could be tested in the apparatus. In order to achieve a sufficient basis for statistical calculations, it was desirable to study several females simultaneously.

At Bunkeflo it was observed that females kept for egg-laying in glass jars almost without exception laid their eggs on the nylon nets covering the jars. They put their ovipositors *through* the nets and attached the eggs to the *outside*. These observations formed the basis for the construction of the egg-laying apparatus.

### THE EGG-LAYING RECORDING APPARATUS

The apparatus (Fig. 1) was built on a 1.5 meter high stand. Two 45 cm high drums, one of which was driven by a twenty-four hour synchronous motor, carried a nylon net. One of the drums could be adjusted by two correction grooves in such a manner that the net was always kept stretched. Sandpaper glued to the drums prevented the net from slipping. When the motor was in use, the net was kept moving at a constant speed. Ten females could be tested in the apparatus at the same time. On each side of the apparatus, five females were kept in small cages connected with a stand. Tests on the minimum space necessary for successful egg-laying had been made in advance. The width of the hole in front of the cages was adjusted to correspond to half the distance the net moved in one hour. This arrangement made it possible to count the number of eggs laid per hour. On both sides of the front holes, round polished metal rods were attached in order to make it easy for the net to pass the cages. The two stands with the female cages could be pressed against the net so as to prevent the females from escaping. The pressure could be controlled by means of correction grooves. The females put their ovipositors through the net and laid their eggs on its outside. This was important, because it prevented the eggs from being crushed by the metal rods. Thus as the net passed the holes in the cages, the eggs were laid on it and then followed the moving net away from the cages. The distance between the cages and the drums was such that the first laid eggs did not reach the drums. By means of a movable egg-counting stand the number

Table 1  
DIEL OVIPOSITIONAL ACTIVITY

species	Night	22-23	23-24	24-01	01-02	02-03	sum
A.exclamationis	28.6	3					3
A.exclamationis	28.6	42					42
A.exclamationis	28.6	13					13
A.exclamationis	28.6		39				39
A.exclamationis	30.6		5				5
A.exclamationis	1.7	71	143				214
A.exclamationis	1.7	5	63				68
A.exclamationis	1.7				132	51	183
A.exclamationis	1.7	21	87				108
A.segetum	1.7	9					9
P.oleracea	1.7	93	17				110
A.exclamationis	2.7	74					74
A.exclamationis	2.7	67	13				80
A.exclamationis	2.7	134					134
A.exclamationis	2.7	98	47				145
A.exclamationis	2.7		13	9			22
A.exclamationis	2.7		23				23
A.exclamationis	3.7	11	37				48
A.exclamationis	3.7			11			11
A.exclamationis	3.7	27	11				38
A.exclamationis	4.7	58					58
A.exclamationis	4.7		69				69
A.exclamationis	4.7				143		143
A.exclamationis	4.7		16				16
A.segetum	4.7		87				87
R.plecta	4.7				38		38
A.exclamationis	5.7					4	4
A.exclamationis	5.7		40				40
A.exclamationis	5.7		18				18
A.exclamationis	5.7		81	3			84
A.exclamationis	6.7	7	52				59
A.exclamationis	6.7				62		62
A.exclamationis	6.7				4	7	11
A.exclamationis	7.7	47					47
A.exclamationis	7.7	15	41	15	8	9	88
A.exclamationis	7.7			4	11		15
A.exclamationis	7.7				9	14	23
A.exclamationis	7.7		88				88
A.exclamationis	7.7	9	32				41
A.exclamationis	7.7	15	38	6			59
Sum		819	1060	48	407	85	2419
Mean		20.5	26.5	1.2	10.2	2.1	60.5
% of total no. of eggs		33.9	43.8	2.0	16.8	3.5	100
No. of egg-laying occasions		20	23	6	8	5	40

Egg-laying occasions: Sign. of diff.

2200 - 2300	$\chi^2 = 0.56$	$0.50 > P > 0.30$
2300 - 2400		
2300 - 2400	$\chi^2 = 9.96$	$0.01 > P > 0.001$
2400 0100		
2200 - 0100	$\chi^2 = 16.06$	$P < 0.001$
2400 - 0300		

Fig. 2 TOTAL NUMBER OF EGGS PER HOUR IN THE EGGLAYING RECORDING APPARATUS.

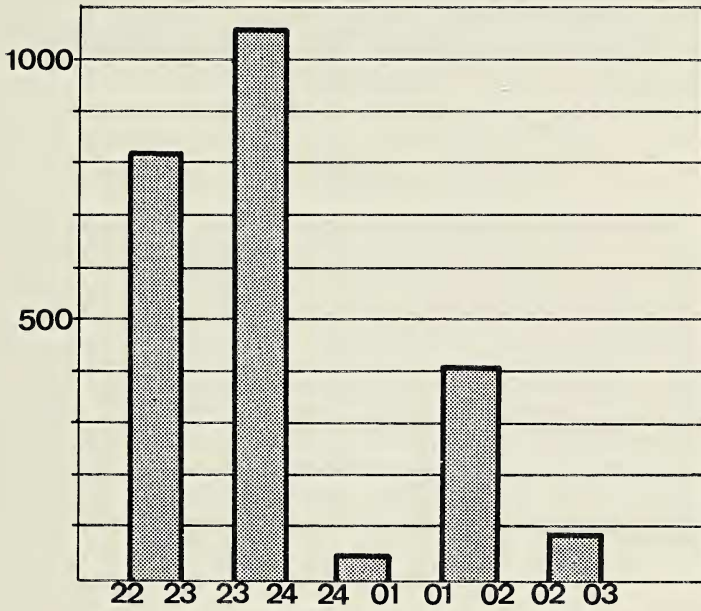
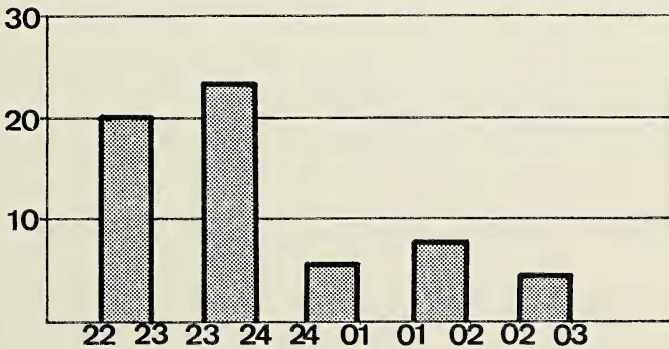


Fig. 3 EGGLAYING OCCASIONS PER HOUR.



of eggs laid by each female per hour could be counted. The eggs were then removed from the net. This task was carried out every morning during the period of observation. The temperature in the cages was controlled from time to time. The stand with the apparatus was covered by a plastic roof, in case of rain, and the construction was intentionally very open in order to allow weather factors (except for rain) to influence the females tested. The apparatus worked both day and night.

## RESULTS

Fifty-three females were tested in the egg-laying recording apparatus. Of these, 48 belonged to *Agrotis exclamationis*, the commonest species at the time. 42 females laid eggs but two deposited them in the cages and were disregarded. Altogether over 2400 eggs were laid, the majority in the early part of the night (Table I and Fig. 2). A second but smaller peak in the egg-laying activity occurred between 0100 and 0200, while only few eggs were laid during the darkest part of the night. The number of egg-laying occasions followed the same pattern (Fig. 3), though less pronouncedly so. Only two of the females took longer than two hours to lay their eggs.

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